

3.1 The Substitution Method

Algebra 2 5.0

Name _____

Date _____ Period _____

© When the solution of a system of equations is an ordered pair that is not located near the origin or that does not contain whole numbers, the graphic method will not be useful.

1) $\begin{cases} x + y = 14 \\ 3x + 2y = 48 \end{cases}$

$$20 + (-6) = 14$$

$$14 = 14 \checkmark$$

$$3(20) + 2(-6) = 48 \checkmark$$

$$x + y = 14$$

$$3x + 2y = 48$$

$(20, -6)$

Steps:

1. Solve one of the equations for one of the variables.

$$\begin{array}{r} x + y = 14 \\ -x \quad -x \\ \hline \end{array}$$

$$y = 14 - x$$

2. Substitute this expression into the other equation and solve.

$$3x + 2(14 - x) = 48$$

$$3x + 28 - 2x = 48$$

$$\begin{array}{r} x + 28 = 48 \\ -28 \quad -28 \\ \hline \end{array}$$

$$x = 20$$

3. Find the corresponding value of the other variable.

$$y = 14 - 20$$

$$y = -6$$

$(20, -6)$

4. Check into both equations.

Consistent
Independent

$$2) \begin{cases} 3x + 2y = 11 \\ x + 4y = 2 \end{cases}$$

$$x + 4y = 2$$

$$x = 2 - 4y$$

$$x = 2 - 4\left(-\frac{1}{2}\right)$$

$$2 + 2$$

$$x = 4$$

$$\left(4, -\frac{1}{2}\right)$$

$$3(2 - 4y) + 2y = 11$$

$$6 - 12y + 2y = 11$$

$$6 - 10y = 11$$

$$-10y = 5$$

$$y = -\frac{1}{2}$$

$$3) \begin{cases} x = 3y \\ 2x - 5y = 4 \end{cases}$$

$$2(3y) - 5y = 4$$

$$6y - 5y = 4$$

$$y = 4$$

$$x = 3(4)$$
$$x = 12$$

$$\checkmark (12, 4)$$

consistent
independent

$$2(12) - 5(4) = 4$$

$$24 - 20 = 4$$

$$4 = 4$$

$$4) \begin{cases} 2x - y = 1 \\ 3y + 3 = 6x \end{cases}$$

$$5) \begin{cases} 4m - 3n = 23 \\ m + 4n = 1 \end{cases}$$

$$\begin{array}{r} m + 4n = 1 \\ -4n \quad -4n \\ \hline m = -4n + 1 \end{array}$$

$$\begin{aligned} 4(-4n + 1) - 3n &= 23 \\ -16n + 4 - 3n &= 23 \\ -19n + 4 &= 23 \\ -19n &= 19 \\ n &= -1 \end{aligned}$$

$$(5, -1)$$

$$\begin{aligned} m &= -4(-1) + 1 \\ m &= 4 + 1 \\ m &= 5 \end{aligned}$$

Homework
Complete 3.1
#1 - 12